

Comment 34: There was a selective use of climate change information in the proposed rule, and the analysis ignored climate information about areas that are cooling.

Our response: We acknowledge that climate change and its effects on various physical processes (such as ice formation and advection, snowfall, precipitation) vary spatially and temporally, and that this has been considered in our analysis. While GCMs are more effective in characterizing climate change on larger scales, we have considered that the changes and effects are not uniform in their timing, location, or magnitude such as identified by Laidre et al. (2005) and Zhang and Walsh (2006). Indeed, the region southwest of Greenland does not show substantial warming by 2050 according to some climate projections. However, most polar bear habitat regions do show the substantial loss of sea ice by 2040–2050. While regional differences in climate change exist, this will not change the effect of climatic warming anticipated to occur within the foreseeable future within the range of polar bears. Updated information on regional climate variability has been added to the section “Overview of Arctic Sea Ice Change.”

Comment 35: The world will be cooler by 2030 based on sunspot cycle phenomena, which is the most important determinant of global warming (e.g., Soon et al. 2005; Jiang et al. 2005).

Our response: The issue of solar influences, including sunspots, in climate change has been considered by many climate scientists, and there is considerable disagreement about any large magnitude of solar influences and their importance (Bertrand et al. 2002; IPCC 2007). The most current synthesis of the IPCC (AR4, p. 30) describes a well established, 11-year cycle with no significant long term trend based on new data obtained through significantly improved measurements over a 28-year period. Solar influence is considered in the IPCC models and is a small effect relative to volcanoes and CO₂ forcing in the later half of the 20th century. While more complex solar influences due to cosmic ray/ionosphere/cloud connections have been hypothesized, there is no clear demonstration of their having a large effect.

Comment 36: The IPCC report fails to give proper weight to the geological context and relationship to climate change.

Our response: Paleoclimatic events were analyzed in the IPCC AR4, which concluded that “Confidence in the understanding of past climate change

and changes in orbital forcing is strengthened by the improved ability of current models to simulate past climate conditions.” Model results indicate that the Last Glacial Maximum (about 21,000 years ago) and the mid-Holocene (6,000 years ago) were different from the current climate not because of random variability, but because of altered seasonal and global forcing linked to known differences in the Earth’s orbit. This additional information has been incorporated in this final rule.

Comment 37: Movement of sea ice from the Arctic depends on the Aleutian Low, Arctic Oscillation (AO), North Atlantic Oscillation (NAO), and Pacific Decadal Oscillation (PDO) rather than GHG emissions.

Our response: Sea ice is lost from the Arctic by a combination of dynamic and thermodynamic mechanisms. Not only is it lost by advection, but lost as a result of changes in surface air and water temperatures. Changes in surface air temperature are strongly influenced by warming linked to GHG emissions, while increases in water temperature are influenced by warming, the sea ice-albedo feedback mechanism, and the influx of warmer subpolar waters (largely in the North Atlantic) (Serreze et al. 2007). Recent studies (IPCC 2007, p. 355; Stroeve et al. 2007; Overland and Wang 2007a, pp. 1–7) recognize considerable natural variability in the pattern of sea ice motion relative to the AO, NAO, and PDO, which will continue into the 21st century. However, the distribution of sea ice thickness is a factor in the amount of sea ice that is advected from the Arctic, and this distribution is significantly affected by surface air and water temperature.

Comment 38: Changes in the sea ice extent vary throughout the Arctic but overall extent has not changed in past 50 years.

Our response: All observational data collected since the 1950s points to a decline in both Arctic sea ice extent and area, as well as an increasing rate of decline over the past decade. While sea ice cover does have a component of natural variability, such variability does not account for the influence that increased air and water temperatures will have on sea ice in the future. The pattern of natural variability will continue, but will be in conjunction with the overall declining trend due to warming, and the combination could result in abrupt declines in sea ice cover faster than would be expected from GHG warming alone.

Comment 39: Evidence that does not support climate change was not included in the analyses.

Our response: We recognize that there are scientific differences of opinion on many aspects of climate change, including the role of natural variability in climate and also the uncertainties involved with both the observational record and climate change projections based on GCMs. We have reviewed a wide range of documents on climate change, including some that espouse the view that the Earth is experiencing natural cycles rather than directional climate change (e.g., Damon and Laut 2004; Foukal et al. 2006). We have consistently relied on synthesis documents (e.g., IPCC AR4; ACIA) that present the consensus view of a very large number of experts on climate change from around the world. We have found that these synthesis reports, as well as the scientific papers used in those reports or resulting from those reports, represent the best available scientific information we can use to inform our decision and have relied upon them and provided citation within our analysis.

Comment 40: Current conditions, based on past variation in Arctic sea ice and air temperatures, are by no means unprecedented and consequently the survival of polar bears and other marine mammals is not of concern.

Our response: We acknowledge that previous warming events (e.g., the Last Interglacial period (LIG), Holocene Thermal Maximum (HTM)) likely affected polar bears to some unknown degree. The fact that polar bears survived these events does not mean that they are not being affected by current sea ice and temperature changes. Indeed, the best available scientific information indicates that several populations are currently being negatively affected, and projections indicate that all populations will be negatively affected within the foreseeable future, such that the species will be in danger of extinction throughout all or a significant portion of its range within that timeframe. We have included additional information regarding previous warming events and an explanation of potential for polar bears to adapt in the section “Effects of Sea Ice Habitat Changes on Polar Bear Prey.”

We agree that there is considerable natural variability and region-to-region differences in sea ice cover as documented by numerous journal articles and other references (Comiso 2001; Omstedt and Chen 2001; Jevrejeva 2001; Polyakov et al. 2003; Laidre and Heide-Jorgensen 2005). However, current conditions are unprecedented (IPCC 2007, p. 24). Climate scientists agree that atmospheric concentrations of